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CENTRAL INTELLIGENCE AGENCY REPORT

INFORMATION FROM

FOREIGN DOCUMENTS OR RADIO BROADCASTS CD NO.

50X1-HUM

COUNTRY	USSR		
SUBJECT	Scientific - Entomology	DATE OF INFORMATION	1949
HOW PUBLISHED	Monthly periodical	DATE DIST.	21 Apr 1950
WHERE PUBLISHED	Moscow	NO. OF PAGES	3
DATE PUBLISHED	Jan 1949		
LANGUAGE	Russian	SUPPLEMENT TO REPORT NO.	

THIS IS UNEVALUATED INFORMATION

SOURCE Les i Step', No 1, 1949.

BIOLOGICAL METHODS IN THE FIGHT AGAINST SHELTER-BELT PESTS

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The shelter belts being created in the arid regions of the USSR require protection against harmful insects from the first days of their planting.

The application of chemical, mechanical, and forestry measures in this struggle requires much manpower, the expenditure of enormous quantities of chemicals, and the availability of the necessary equipment. Therefore, to supplement the measures stated above, the introduction of biological methods into the struggle against shelter-belt pests is a serious task of Soviet pathologists.

A biological method of combating pests in the forests and shelter belts must be based mainly on the experiments of Soviet scientists in the fields of plant culture and animal husbandry. In the forests there are useful carnivorous and parasitic insects and harmful insects such as caterpillars, butterflies, long-horned beetles, moths, saw flies, aphids, etc. While the former are merely parasites, the latter are economic parasites.

In harmony with the natural struggle among the insects, the problem arises how to increase effectively the activity of the useful insects against the harmful by changing conditions of existence so as to make the useful insects more hardy and numerous.

With the establishment of shelter belts, there will develop in the steppe new artificial plant groupings in which new entomological fauna will also spring up. It is necessary to anticipate the fact that among the insects there will be a vast multitude of harmful insects, one of the causes of reduced harvests. In this connection, carnivorous and parasitic insects and insect-eating and mouse-eating birds should be made to play an important role.

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ARMY	X	AIR	X	FBI		

An effective solution of this problem requires renewed study of the shelter belts, of the relationship between economic parasites and useful parasites, of the biology, ecology, and geographical distribution of useful insects, and of the factors which combine to promote multiplication of the useful insects. It is also necessary to investigate the influence of various forest cultivation and forestry practices on the development of useful insects, the influence of surrounding conditions and of ground cover on their multiplication, etc. In addition, it is necessary to work out a method and techniques for increasing the effectiveness and utilization of useful fauna in the shelter belts.

All of these problems have so far been little investigated. But, their complete solution must not be awaited before action is taken. According to Academician T. D. Lysenko, it is necessary "to combine theory and practice, in spite of the fact that even theory is still lagging."

To safeguard the shelter belts from pests, it is necessary quickly to make use of the many experimental observations accumulated by Soviet tree pathologists concerning the influence of various factors in increasing the effectiveness of useful insects. Substantiation of these observations can come later.

The tree pathologists must recommend biological combat methods based on the Michurin theory. In doing so, they should not consider introducing useful forms of insects from elsewhere but, for the most part, make use of local forms of fauna. Even in 1936, Academician T. D. Lysenko brilliantly used ichneumon flies against pentatomidae bugs, a very serious agricultural plant pest.

These problems have already been solved in regard to useful plants and animals. Michurin's followers in Soviet biological science have accomplished much for agriculture and animal husbandry in the way of selection, acclimatization, and hybridization.

Tree pathologists must follow a similar path in developing biological methods for combating harmful fauna.

The following biological agents must play an effective role in controlling fauna harmful to shelter belts: nematoda (nemathelminthes), tachina flies, bulb flies, ichneumon flies, brachycera flies, wasps, and carnivorous beetles such as ladybirds and ground beetles.

Another effective agent for destroying various harmful insects is the ordinary forest tree ant. In the course of a single day, one hill collects up to 20,000 insects and about 2 million in the course of a year.

Dragon flies energetically hunt down harmful butterflies. Insect-eating and mouse-eating birds, amphibia, and mammalia are also of enormous importance.

Ernestia rudis tachina flies, Banchus femoralis ichneumon flies, and birds such as crows, rooks, and jackdaws can be recommended as active agents against the pine cutworm moth.

Ichneumon nigritarius and Neteropelma calcator ichneumon flies, Lydella nigripes and Carcelia rutilla tachina flies, and such birds as titmice, nutcrackers, woodpeckers, rooks, thrushes, jackdaws, and cuckoos are recommended in Soviet entomological literature against pine measuring-worm moths.

Telenomus and Trichogramma evanescens ichneumon flies. Sturmia scutellata tachina flies, ground beetles, and such birds as nuthatches, jays, orioles, hoopoes, starlings, and titmice play an important role in combating pine silkworms.

An increase in the number of Pteromalus nidulans, Pimpla examinator, and Telonomus phalaenarum ichneumon flies, Sturmia scutellata tachina flies, ground beetles,

and such birds as titmice, starlings, and others is recommended for the struggle against the activity of brown-tail moths.

Anastatus disparus flies, Dermestes carnivorous beetles, and birds are useful against silk-spinning worms.

The use of various lures can be recommended for increasing the effectiveness of parasitic flies against shelter-belt pests, both in regard to attracting useful insects and in regard to lengthening their adult lives.

Experiments have shown that a dependable lure for attracting ichneumon flies is a sugar syrup made up by mixing 10 grams of sugar with a liter of water.

Experiments conducted by the author in sowing plants of the carrot family have also shown favorable results. The following plants are recommended: garden fennel, flat-leaved eryngo (Eryngium planum), sanicle (Sanicula europaea), ordinary gout weed (Aegopodium podagraria), aromatic chervil (Chaerophyllum aromaticum), and others.

It has been experimentally shown that interbreeding of slightly differing forms of insects has resulted in increasing the fertility, viability, and reproductivity of the new form. For example, interbreeding of Doryctes mutillator ichneumon flies taken in Leningrad Oblast and in Vladimir Oblast resulted in a more viable and more reproductive form of fly.

Taking ichneumon flies from one oblast to another has shown satisfactory results. Thus, Rhyssa persuasoria flies were taken from Leningrad Oblast forest into a similar type of forest in Vladimir Oblast with good results. The transfer resulted in speeding up the multiplication of parasites in the new area and in reducing the number of pests.

It is expedient to establish laboratories for artificial production of egg-eating ichneumon flies in the zones where shelter belts are being planted. It is known that the Trichogramma evanescens fly acts as a parasite on the eggs of a number of forest pests such as the pine cutworm moth, the cedar silkworm, the pine measuring-worm moth, the oak leaf roller, and others. The work of Rybkin, Smirnov, Vasil'yev, and others in raising the Trichogramma fly and releasing it in various regions of the USSR produced positive results. The steppe forest administrators of the country should concern themselves with the problem of raising ichneumon flies artificially so as to prevent or destroy the reproduction of harmful insects.

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